A SURVEY OF THE "3M SYSTEM"

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THE "3 M SYSTEM"

by

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Submitted in partial fulfillment of
the requirements for the degree of

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IN
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ABSTRACT

In recent years the management of Navy maintenance and material resources has been lagging behind technological progress. Decision makers have been unable to obtain the information necessary to exercise proper control over operational requirements, and the existing maintenance organization could not provide answers to questions concerning systems readiness in relation to manpower, material, and time expenditures. A new program, the Standard Navy Maintenance Management System (SNMMS), was designed to improve overall readiness.

Data used in this study was gathered from Navy, Air Force, and management sources. Contemporary techniques were synthesized and compared to those being used within SNMMS.

The "3 M System" is a highly desirable improvement in Navy maintenance. Although a few fundamental weaknesses do exist, a commendable level of total systems analysis was achieved during its development stage.

Acknowledgement

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CHAPTER I

THE PROBLEM

Introduction

For years Navy maintenance functions have been administered, scheduled, and controlled through the use of charts, codes, grease pencils and colored tapes. These aids have frequently been rough estimates at best. They normally portray but one path toward the ultimate goal which is the highest attainable degree of fleet and material readiness. Little thought is given to alternative plans, and very little to the inter-relationships and tradeoffs among individual tasks contained within the portrayed plan. If a project is even moderately extensive, the likelihood is great that somewhere in its evolution, a single task not previously considered, will delay completion.

In 1959, thoroughly planned and scheduled, uniformly organized maintenance was being closely considered at the highest levels within the Navy. Among other things, the Naval Aircraft Maintenance Program, a first in standardization of organizations on a Navy wide scale, was promulgated.[1] Further, Admiral Arleigh A. Burke, then Chief of Naval Operations, became aware of certain British work study techniques through conversations with the First Sea Lord of the Admiralty. Admiral Burke sent a group of Navy

[1]Chief of the Bureau of Naval Weapons, The Naval Aircraft Maintenance Program. BUWEPSINST 4700.2. (Washington: 21 June, 1962), p. 2-3.

Officers to Britain to evaluate this new idea and explore the feasibility of incorporating it into the U. S. Navy.[2] The benefits attainable through work study, essentially the application of industrial engineering techniques, favorably impressed the visiting officers and culminated in the establishment of Fleet Work Study Groups. These groups were assigned the mission of employing engineering techniques "where directed by the Chief of Naval Operations based on requests received from within the naval establishment in order to determine and recommend the best possible use of human and material resources."[3]

Early in its existence, the Pacific Work Study Group undertook a project to determine how to reduce the down time incident to scheduled maintenance in a light attack squadron. Industrial engineering techniques were adapted to the circumstances and successfully employed. Quality control was enhanced, down time was cut by two-thirds, and availability was increased by a margin which was equivalent to an additional five aircraft.[4] These techniques were again and again applied with continuing success to other units of both fleets. By 1962, the advantages of the work study techniques were widely known and well supported by actual performance. The decision was subsequently made and promulgated by the Chief of Naval Operations to install a standard

[2] Clifford M. Johns, "Work Study Groups: Trouble Shooters of The Fleet," United States Naval Institute Proceedings, LXXXIX (November, 1963), 53.

[3] Ibid.

[4] Ibid., p. 54.

maintenance management system throughout the operating forces. In addition, a parallel maintenance data collection and analysis system was to be designed and installed. The new program, known as the Standard Navy Maintenance Management System (SNMMS), frequently referred to as the "3 M System" (Material Maintenance Management), is presently being implemented by the Fleet Work Study Groups. Unlike previous maintenance reorganizations, SNMMS is intended to be considerably more than a mere change of labels. It is to be firmly based on the Total Systems Concept (TSC). Simply stated, TSC calls for an overall study of all the systems and tasks of an organization before making major revisions in any one area. This does not mean that everything has to be changed at once, but rather that the overall plan be implemented in individual areas over a period of time. SNMMS is closely related to the findings and recommendations contained in the Review Of Management Of The Department Of The Navy (Dillion Report) and is designed to provide much of the quantitative information now so necessary within the defense establishment. The system, considered by its advocates to be compatible with both the old and the new, will be especially desirable in areas of advanced technology when dealing with expensive, sophisticated, modern weapon systems.

The Problem

Presently the Navy exists in an era of complex, quick-time, operational requirements. Decision makers must have the best possible continuing control over all operations for which they are responsible. Command and management are daily required to

make more and more complex decisions while having less time in which to consider the various possible results. A quick-time operational maintenance system, capable of analyzing and feeding back timely, significant information is a highly desirable goal. An expansion of SNMMS, if the system is successful, must be able to provide this. Meanwhile, efficient and effective management calls for sound planning and competent restraints against techniques that might possibly result in costly confusion and delays, personnel errors, inaccuracy, misinterpretation, and slowdowns. Initially, therefore, the Standard Navy Maintenance Management System must keep management constantly informed as to what decisions to make so that maintenance operations will be in consonance with operational plans and schedules and lead to the desired results. In other words, a system must be devised that is highly reliable, has rapid response, and a problem solving capability that assists command to act promptly in controlling personnel and equipment before, during, and after a required operation. As such, SNMMS essentially must be a command and control organization closely allied to an effective logistics system.

FEASIBILITY

Is a system of this type, capable of providing the required information, feasible? A few years ago, the answer would have been a qualified maybe. Today the answer is a definite unqualified yes. The reason is the computer. The present equipment evolution within the Navy from relative simplicity to extreme complexity,

has correspondingly increased the quality, quantity, and frequency of maintenance demanded. An increase in required direct maintenance labor would ordinarily be accompanied by an increase in the indirect labor requirements to perform the paperwork functions of administration, records, and reports. However, with the advent of the computer, which one federal official refers to as the "greatest development in government administration since government began,"[5] it is presently considered possible to essentially hold the line in the area of indirect personnel requirements.

CHOOSING THE OPTIMUM

Is SNMMS the logical choice? Have all its problem areas been sought out, investigated, and evaluated? Has SNMMS been judged superior to other systems? Will the system be readily accepted and supported by maintenance personnel? Are the users likely to trust SNMMS? Will SNMMS replace other functions or will it simply duplicate them? These are a few of the questions that should have been asked and answered in the affirmative prior to the commencement of system installation. Were they?

PURPOSE AND SCOPE

It is the purpose of this paper (1) to comprehensively review performed and contemplated actions in the Standard Navy Maintenance Management System (SNMMS), its subdivisions, the Planned Maintenance System (PMS), and the Maintenance Data Collection System

[5]Richard F. Janssen, "Federal Computers, Electronic Devices Aid Government Efficiency But Create Problems," The Wall Street Journal, December 30, 1964, pp. 1, 8.

(MDCS); and (2) to analyze the system as designed and installed, contrasting its goals, techniques, and objectives to a synthesis of some of the principles set forth by management and data collection/processing authorities.

ASSUMPTIONS

The assumption is herein made that the Navy will find it to be in the best interests of efficiency, effectiveness, and accuracy to utilize certain management and automatic data processing (ADP) techniques in a manner similar to that advocated by modern managers and employed by industry. Further, it is also assumed that "effective production of a coordinated and uninterrupted flow of essential data needed by management in its decision-making, control, and planning functions, through the systematic organization of all related clerical functions," known as integrated data processing (IDP), is highly desirable.[6]

[6] Harvey W. Protzel, "What Top Management Should Expect From An Integrated Data Processing System," Computers And Automation, XIII (September, 1964), 14.

CHAPTER II

REVIEW OF THE LITERATURE

Much has been written on the subject of Navy Maintenance. Until very recently, the vast majority of related items dealt with repair procedures and techniques, required inspections, material allowances, after the fact reports, and other traditional maintenance functions. Little, if anything, concerned with command relationships, responsibilities, preventive maintenance planning, organization, the various fields of maintenance management control, efficiency, or effectiveness, was produced and promulgated. In the last several years the content of Navy maintenance related literature has changed somewhat in order to reflect current interest in the areas mentioned above and the increasing need for coordination, accurate information, timeliness, sound policies, and knowledgeable application of management and leadership techniques. Still, information concerning Navy maintenance, based on sound management concepts, is limited. The Fleet Work Study Group, Pacific, responsible for the development and installation of the Standard Navy Maintenance System (SNMMS) in the operating forces of the Pacific Fleet, was the major source of planned maintenance and Navy data collection related literature obtained. In addition, Fleet Work Study Group, Pacific, provided pertinent audio-visual information during a series of presentations and conferences.

In order to effectively review, analyze, and evaluate SNMMS,

it was necessary to broaden the literature review. Sources included applicable Navy documents, supplemented by Air Force maintenance management directives, the works of various management and data processing authorities, and a few related unpublished papers.

Navy Literature

Navy literature, in general limited to directives, correspondence, and a few service magazine articles, is of recent origin but rather scarce. In the main it is concerned with the background of Navy maintenance, the reasons why SNMMS was developed, the concepts SNMMS employs, and a few progress reports. Another important aspect is the overall interest in the system readily displayed in the correspondence of the Chief of Naval Operations, various type commanders, and other flag officers. A high degree of optimism appears to be the common denominator in this area.

Air Force Literature

Of considerable assistance as a preliminary information source is the Air Force Maintenance Management Manual which sets forth the maintenance management system for all Air Force activities. This document was used during the initial design stages of SNMMS as a guide for the development of workable data collection/processing techniques.

Academic and Management Authorities

Material of this nature is available in considerable depth. Works that scan the management spectrum, from the quantitative to the human behavioral oriented, are readily accessable in the U. S.

Naval Postgraduate School library and text book issue. Publications of learned groups, such as the American Management Association, in addition to various other sources including magazines, newspapers, and house organs, were reviewed.

The Review

Source material was examined beginning with the Air Force literature and the works of the academic and management authorities. An effort was made to assimilate applicable Air Force methods, techniques, and procedures, compare these with the theories and concepts of a wide range of respected management authorities, and then synthesize the resulting ideas into a methodical survey and analysis of the Planned Maintenance System (PMS) and the Maintenance Data Collection System (MDCS).

Coupled with a knowledge of the past workings and shortcomings of Navy maintenance, this method, although time consuming, did provide a suitable background for analysis and evaluation of SNMMS. Furthermore, this approach not only provided a contrast between the old and new in Navy maintenance, but also between the past and present in other aspects of Navy management. Where only a few years ago we could expect to encounter relatively unsophisticated, inflexible (frequently attributing this inflexibility to the traditions of the Navy) managers, we now encounter an increasing number of sophisticated and well-informed thinkers and managers, advancing their capabilities to match the advances in our complex weapon systems. The inertia to resist change in techniques has not been totally eliminated, but the high degree of optimism

concerning the benefits of SNMMS, readily apparent at all levels of Navy management, makes this inertia somewhat less discernible. This in itself should prove to be of great value if only because of the elimination of adverse influence on personnel new to the Navy.

CHAPTER III

MAINTENANCE: SEARCH FOR A SOLUTION

During recent years it has become apparent that the proper management of maintenance and material resources within the operating forces of the Navy was lagging behind advances in technology. Maintenance functions were in many instances handicapped by a lack of decision making information. Weapons systems were ever increasing in number and complexity, while maintenance procedures, maintenance information, and the average maintenance man were tending toward obsolescence. Fortunately, prior to chaos, it became evident that the newer, sophisticated systems were demanding a greater percentage of an already short supply of maintenance capability. What was to be done about this situation? With the maintenance practices then in existence, no determination could be made as to whether over-maintenance in some areas was causing or contributing to this rapidly mounting shortage, or if the condition of under-maintenance, known to exist on the complex systems, was general.

It became apparent that a method must be devised to measure systems readiness in relation to the outlay in materials, time, and manpower. The basic methods, formulated around the newer complex weapons systems, were then extended to include all the activities of the Navy responsible for the maintenance, support, operation, management control or technical direction of units of the operating forces.

The approach decided upon was the development and implementation of a Standard Navy Maintenance Management System (SNMMS), throughout the operating forces, under the direct sponsorship of the Chief of Naval Operations, as set forth in the OPNAV Instruction 4700.16 series. The objective of this program "is the improvement of the material readiness of the fleet through improved management of maintenance and material functions," with a January 1966 goal of "an improved, measurable state of material readiness of the operating forces of the Navy with a significant increase in the efficient management of the Navy's maintenance and material resources."[1]

SNMMS was introduced on a time-phased basis with little advance notice because of the rapid development of a critical situation within the field of maintenance. The program, as set forth, was both broad in scope and ambitious. Since manning levels, budgets and appropriations for the period were already implemented, requirements were met through curtailments in areas of lesser importance to the operating forces. To this end, the Chief of Naval Operations established a project center to expedite the development of the system. Further, since the urgency of the requirement precluded "the luxury of routine prolonged Navy Department review and processing of the project center's final project,"[2]

[1]Chief of Naval Operations, Standard Navy Maintenance Management System. OPNAVINST 4700.16A. (Washington: 1 August, 1963), Enclosure 1, p. 1.

[2]Chief of Naval Operations, Standard Navy Maintenance Management System. OPNAV message 111350Z. (Washington: 11 June, 1964).

all departmental agencies involved in the implementation of SNMMS were required to provide representation at the project center. This representation was to consist of "qualified and authoritative individuals on a continuous basis."[3]

As can be seen from the foregoing, the development and installation of SNMMS has been somewhat different that what we in the Navy consider the norm in methods of evolution. It is not the purpose or intention of this paper to consider the reasons why an improvement in our archaic maintenance system was so long in coming, but only to review and attempt to analyze what has been accomplished and what is presently contemplated from the viewpoint of its soundness and adherence to contemporary management theories and procedures. In that regard it will do well to remember that SNMMS is still under development and as such may have undergone changes and modifications in policy and procedures which have not been reflected in documents and other sources of information presently available.

I. REVIEW AND ANALYSIS

SNMMS is intended to "replace existing systems of maintenance reporting, record keeping, and management,"[4] while retaining the majority of basic supervisory positions as they now exist.

Within the ships of the operating forces, where maintenance is normally performed in a number of departments by operating personnel, the lines of authority and responsibility run from the

[3] Ibid.

[4] Chief of Naval Personnel, Proposed Training Plan To Support The Introduction Of The Standard Navy Maintenance Management System. BUPERS letter, serial C21/1061, 6 April 1964, p. 2.

department head to the individual man assigned to the job by way of division officer and maintenance group supervisor. In addition, a central maintenance control will be designated and assigned the task of ensuring accuracy and completeness of all reports.

Aviation activities, such as squadrons, emphasize the intrinsic position of maintenance by the existence of the Maintenance Department, usually the largest in terms of money spent, personnel assigned, amount of support equipment retained, and the degree of influence in the area of overall operational readiness.

Assignment of Functions

Under SNMMS maintenance functions have been clearly assigned. Responsibilities are delineated and administrative techniques have been devised to schedule and control work compliance. Sufficient control, without undue interference, was considered during formulation.

Responsibility

Emphasis is placed on the ultimate responsibility of the Commanding Officer for material readiness through the coordination and accomplishment of maintenance. Department heads are charged with the responsibility for maintenance performance, coordination with other departments as necessary, scheduling, ensuring compliance, and the assignment of supervisory personnel. Division officers are responsible for monitoring the various scheduling devices and other tasks as directed. Maintenance group supervisors hold the responsibility for the weekly scheduling, personnel

assignment, and performance of work assigned to the group.

Organization

SNMMS will utilize the traditional line-staff organization. Shipboard organizations, although not as clearly defined as those in aviation, are of the same general type.

There is no evidence that organizational structure was critically considered in devising SNMMS. This may result from either the known Navy resistance to the basic Air Force organization or the desire to preserve a traditional Navy structure. Either way, the application of TCS has been compromised. The obvious question concerns whether the existing structure is suitable for the performance of maintenance with a minimum of effort and yet effectively provide to management the requisite means to plan, schedule, and control.

The specialization base within SNMMS is the Maintenance Group. In a destroyer this could be an engine room, fire room, or other departmental functional space. In an aircraft squadron a delineation is made along the lines of a system such as hydraulics, communications, navigation, etc. The intent of this division is to permit concentration of effort on the simplest possible component of even the most complex hardware.

According to Johns, the "3 M System" was designed with full consideration being given to ease and efficiency of management.[5] The Maintenance Group Supervisor, his men, and his superiors, each

[5]Clifford M. Johns, "3M System," Approach, X (February, 1965), 36-41.

have a clearly defined responsibility and associated authority. The organization, according to Rasmussen, is compatible with the exception principle.[6] Each supervisor, in performing his function, provides the next higher echelon with a simplified visual presentation of progress made contrasted with what was scheduled. Extensive detail, which might tend to confuse when the system is operating as designed, is not displayed, but is available upon request. Guidance and direction is available and continuously provided at all levels. Command is integrated into the system for the purpose of providing full support and cooperation.

SNMMS is not primarily intended to set forth departmental organization and billets. However, there is every likelihood that the trend toward standardization among Navy activities will be enhanced by it and the continually increasing requirement that military problems be regarded as economic problems.

II. SNMMS: THE NEED

Common sense and experience, supplemented by schools, bureau manuals and manufacturer's guides, is no longer sufficient to keep the fleet maintained and operating--steaming and flying.[7] Time has moved on, ships and aircraft are more complex, and specialized training is a requirement for most maintenance functions. In-house personnel can no longer efficiently and effectively perform all that our equipment requires without extensive training. The

[6] A. L. Rasmussen, "Maintenance System Changes Phase II," Approach, IX (June, 1964), 36-39.

[7] Robert Neil, "Planned Maintenance: Here's How It Works," All Hands (August, 1964).

seaman's eye approach, regulated by common sense, no longer does the job properly. Paper, reports, and reams of directives previously were thought to be the answer. Equipment became more complex and the volume of paperwork increased. The end of the maze of paper was not in sight, but the limits of personnel, time, and money was rapidly approaching. An urgent need for action became apparent. The Chief of Naval Operations took action, the result being SNMMS.

III. SNMMS: INSTALLATION

The installation and implementation of the "3 M System" has been separated into two major parallel programs: (1) the development and installation of a planned maintenance system (PMS), referred to as Milestone Plan A; and, (2) the development of a uniform maintenance data collection system, Milestone Plan B.[8]

These programs are slated to provide the basis for uniform planned maintenance, the collection of data in a form that will facilitate machine processing, and the establishment of an activity capable of processing and analyzing the maintenance information received. The analyzed data will then be utilized in providing feedback and responsible assistance to the operating forces.[9]

[8]OPNAVINST 4700.16A, op. cit., p. 2

[9]Department Of The Navy, Office Of The Secretary, Standard Navy Maintenance And Material Management System (3 M System). SECNAVINST 5430.69. (Washington: 21 October, 1964), p. 1.

IV. PLANNED MAINTENANCE SYSTEM

Program Milestone Plan A, the Planned Maintenance System, is being developed and installed throughout the operating forces with emphasis being placed on maintenance at the lowest practicable echelon.

Within Plan A, tasks are divided into four major segments:[10]

1. Development of preventive maintenance documentation.
2. Development of uniform standards of maintenance planning, control, and recording.
3. Installation of standard maintenance management throughout the operating forces.
4. Development of a system to control the standards.

Documentation

Initially, a requirement existed for the evaluation and standardization of all maintenance documents, regardless of source or intent. This is presently being done with the view of critically examining the need and compatibility (with PMS) of documents presently in existence.[11] Extraneous materials, requirements and procedures are to be eliminated. The resulting documents are to be feasible; that is, consistent with the skills, time, and manpower available within the operating forces.[12] Once these criteria have been satisfied, all maintenance documentation will be compatible with SNMMS.

[10]OPNAVINST 4700.16A, op. cit., p. 3.

[11]Ibid.

[12]Ibid.

Planning and Control

Maintenance planning, control and recording systems have tended to be profuse in the Navy. Some of these have emanated from the bureaus while others originated with type commanders, fleet commanders, and air wing commanders to name but a few. Many of the procedures set forth are good and have been both efficient and effective. However, they must all be reviewed so as to eliminate duplication, allow standardization on the best, and ensure compatibility with the data collection and processing system.

One of the methods of achieving effective control which has been utilized extensively in PMS is long range scheduling. "Effective advance scheduling is the key to success in any maintenance program. Proper use of ... scheduling devices ... will ensure accomplishment of all preventive maintenance tasks and will take into consideration the ... employment schedule and daily routine, will provide intra-departmental coordination, and provide adequate flexibility to allow adjustment to the schedule when the situation dictates. The objective is to schedule maintenance tasks at least one quarter ahead as soon as the subsequent quarter's employment is known. This plan may then be adjusted as contingencies demand. Emphasis must be placed on advanced planning rather than on the recording of mere historical maintenance facts.

"Intelligent use of the weekly schedule ... will ensure definitive assignment of maintenance responsibility to a specific person. Corrective maintenance tasks which arise must be properly

coordinated with routine preventive maintenance: for example, a required corrective maintenance action on a pump might provide an excellent opportunity to accomplish a preventive maintenance requirement that is scheduled or vice versa."[13]

A key factor in effective, efficient management is complete understanding of the duties and responsibilities assigned. The Planned Maintenance System is provided with a number of "tools" designed to assist in meeting this requirement.

Planned Maintenance System Manual-The Planned Maintenance System Manual contains a compilation of the minimum preventive maintenance requirements for each installed component or system. These requirements were gleaned from a myriad of sources including bureau manuals, manufacturer's instruction books, fleet and type commanders directives, and the experience of operating personnel. A compilation of this kind, to be thorough, requires critical examination to eliminate extraneous material, but yet ensure that all necessary requirements are included.

Cycle Schedule-The Cycle Schedule is a visual display of preventive maintenance requirements, to be performed by a particular maintenance group, based on the overhaul cycle. Issued by the type commander, it shows all quarterly preventive maintenance actions by system, sub-system or component. The Cycle Schedule commences with the completion of overhaul and includes the time period through next overhaul. All items on it are within the

[13]Maintenance Of Material. Proposed Advance Change to Chapter 11, NWP 50A. (Washington: undated), p. 5.

capability of on-board personnel, and are scheduled so as to equalize workload throughout the cycle.

Quarterly Schedule-Prepared by the department head in conjunction with his division officers and maintenance group supervisors, the Quarterly Schedule is based on the data set forth in the Cycle Schedule with due consideration being given to operational schedule requirements. It displays the entire preventive maintenance workload for the quarter and directs maintenance group supervisors scheduling weekly maintenance. Posted with the Cycle Schedule on a control board, the Quarterly Schedule provides a view of the overall maintenance program, pointing out problem areas where special attention may be required. Items not accomplished within the current quarter are carried over to the subsequent Quarterly Schedule.

Weekly Schedule-The Weekly Schedule, based on the directives contained in the Quarterly Schedule, is prepared by the maintenance group supervisor and is displayed in the group's working area. It permits the daily scheduling of individuals to perform required maintenance. Recurring maintenance, not specified in the long range (Cycle and Quarterly) schedules, will be scheduled here. The group supervisor will update the Quarterly Schedule at the end of each week.

Maintenance Requirement Card (MRC)-The MRC is a 5 x 8 card designed to set forth a specific planned maintenance action. It contains the minimum required scheduling information and the complete sequence of events to accomplish a certain preventive

maintenance task on an item of equipment. The MRC lists tools and parts required, frequency, minimum skill levels, manhours to accomplish, and other detailed information valuable to both performing and supervisory personnel. A complete MRC deck will supersede and eliminate preventive maintenance directives set forth in the various maintenance related documents. The MRC, originally developed for use on recent model aircraft, contains sufficient details so as to be valuable in the development of on-the-job-training programs. The content of the MRC is approved by the cognizant technical bureau.

PMS Installation

Initial evaluation and review of existing procedures, and the installation of PMS in the operating forces is to be carried out by the Fleet Work Study Groups. Fleet and type commanders are directed to assist in expediting introduction of SNMMS by providing temporary personnel for training and assignment to development and installation teams.[14]

Post Installation Control

Standardization control of PMS, subsequent to installation, will be through the procurement of adequate maintenance documentation, continuous evaluation of equipment maintenance requirements, installation of PMS in new construction, and adequate control of documents available to the operating forces.[15]

[14]BUPERS letter, serial C21/1061, op. cit., p. 4.

[15]Ibid.

V. MAINTENANCE DATA COLLECTION SYSTEM

Program Milestone B, the Maintenance Data Collection System (MDCS), is assigned the basic objective of providing "required information and statistics as a basis upon which maintenance managers can effectively and efficiently manage the Navy's maintenance and material resources."[16]

At the instigation of the Secretary of Defense, subsequent to his declaration that Navy maintenance data compared unfavorably with Air Force data, the Navy examined the Air Force Maintenance Data Collection System as set forth in Air Force Manual 66-1.[17] Methods of data collection which had proven satisfactory in the Air Force system were compared in detail with other data collection systems. The methods thought to be best were taken and adapted to Navy requirements. These requirements have been defined as the best possible information to satisfy both management and technical data requirements.

Operational Evaluation

Initial procedures adopted are presently being tested in an operating environment by the Maintenance and Material Project Center. Organized for the purpose of studying data processing techniques, the Project Center, under the control of the Chief of Naval Operations, has the mission of establishing and documenting procedures for Navy-wide application.

The final data collection system decided upon is to reflect

[16] OPNAVINST 4700.16A, op. cit., p. 5.

[17] Johns, op. cit., p. 36.

the results of this test. Recommendations to improve the system, define functions and responsibilities, and eliminate redundancy and inconsistency, are being solicited from both data producing activities and the commands receiving the reports. Upon completion of this evaluation phase, applicable methods and functions are to be modified and refined as required.

VI. WHY PROCESS DATA?

Modern data collection and processing has the potential of contributing to management problem solving in many ways. Complete and detailed facts are kept readily available, routine operating documents are produced and updated, masses of facts are reduced to succinct, informative reports, while the condition of the enterprise can be continually analyzed and evaluated. Another contribution of data processing is the instilling of a hope in management that the current increasing trend in volume and cost of paperwork can somehow be stopped and reversed.

Data Collection

MDCS utilizes a system of codes which have been designed to permit machine processing and mechanic/technician coding.[18] These codes provide the capability of recording the equipment and component involved, the administrative organization, the work center, how the malfunction occurred, the circumstances of discovery, and the corrective action taken. In addition, information is available concerning repair parts needed, type repair performed, what

[18] Chief of Naval Operations, Equipment Identification Code Manual, Engineering Department. (Washington: October, 1964).

activity performed the work, the nature of preventive or unscheduled maintenance (type availability) involved, and the number of man-hours required.

Unfortunately, the collection system is manual. Human operators record data by hand on the various report forms. Intermediate operators, presently at type commander selected locations, again transcribe the data from the report forms to punch cards. Needless to say, this method is not only time consuming, but of perhaps greater importance, is susceptible to both initial and intermediate operator induced errors.

Data Processing

Data is processed to obtain facts about operations and information for control. The ultimate aim is to provide management with a timely, reliable source of readily accessible and fully documented information. As such the data must be in a form that facilitates search and retrieval of specific facts, and permits the compilation of these facts into reports emphasizing the points of interest or concern. Too much data, that is data unrelated to the subject to be analyzed, can be as detrimental to a system as incomplete or inaccurate data.

The processing phase begins with the information generating action and ends when the analysis has been completed, the records have been brought up to date, and the documents and reports have been generated. At times the documents and reports may themselves be new data sources and as such continue the processing cycle.

Data processing will not be done within the individual units

of the operating forces. A Processing Center, functioning under the type commander, is established for this purpose. At the present time, key punch equipment, although programmed eventually for destroyers and larger ships, is available only in the Center. Data to be processed for use within the "3 M System" is delivered to the Center by messenger or U. S. mail, there being no data transmission equipment presently programmed for the operating forces.

Was the decision to operate a data processing and analysis system without data transmission equipment a sound one in light of the fact that the raw data sources are in most cases mobile? This situation, like the acceptance of the traditional Navy organization, reflects the "hardware" approach in an area where the integrated approach is a necessity. The "hardware" approach is characterized by introducing a computer into an existing system without the required change in management thinking.[19]

Data Analysis

Besides being able to provide facts directly concerning the preventive maintenance accomplished, MDCS is designed with the intent of facilitating thorough analysis of the basic problem area. System reliability, failure rates based on operating time and inspection periods, and other maintenance and material matters, such as spare parts provisioning information, is available within the assembled data. The importance of form and method of storage, with

[19]Roger C. Vergin and Andrew J. Grimes, "Management Myths And EDP," California Management Review, VII (Fall, 1964), 63.

the necessity of data retrieval in mind, is of utmost importance here. If successful, the stored information is to be used as an aid in manpower planning, budget computations, and cost analysis.

The analyzing function will be performed at both the type commander's Processing Center and at a central processing activity. Intentions are to utilize accounting machines at the Processing Centers and a computer at the central activity. The computer is capable of performing operations which, with proper information available, will provide all the information mentioned above. Accounting machine operations are of a more limited nature. They are not as flexible as the automatic computer and will be utilized to provide listings and keep track of man-hours, malfunctions, useage, and similar information. In addition, the accounting machines will compile the necessary data for human analysis.

VII. SUMMARY

SNMMS is intended to achieve maximum attainable material readiness and efficiency through command attention, policy and technical direction, and management control and administration of all programs. Maintenance of the various systems, both old and new, has been segmented into specific detailed procedures with the view of attaining simplification and scheduling feasibility. The data collection and analysis system, presently undergoing operational evaluation, reflects a familiarity with the concepts of integrated data processing, while at the same time apparently losing sight of the long range goal of a real-time system. This is evidenced by the lack of noticeable concern surrounding the use

of the mails and messenger service for data transmission purposes.

The organization upon which the "3 M System" is based is the traditional military structure. No evidence exists in the various publications, nor was any available through Fleet Work Study Group, Pacific, that TSC and the integrated system were considered in this area.

There exists a distinct possibility that SNMMS, as it is now contemplated, embraces some fundamental weaknesses. Of greatest concern are the methods of data collection/transmission and the superficial analysis of the maintenance organizational structure. These areas will be analyzed further in Chapter IV.

CHAPTER IV

MAINTENANCE: A SOLUTION!

The "3 M System" and its subdivisions, the Planned Maintenance System and the Maintenance Data Collection System, appear to have achieved wide spread acceptance. The Commander, Destroyer Flotilla Nine, cites SNMMS effectiveness and recommends rapid expansion of the system.[1] He furnishes ample example of what a well conceived, assiduously applied, systematic attack on known maintenance deficiencies can accomplish in the "Stoddard Story," which relates one destroyer's remedial program.[2] The Commander, Naval Air Force, U. S. Atlantic Fleet, reports that "activities now working with the Air Force 66-1 system have expressed enthusiastic interest in the new ability to analyze in detail the direction and results of their labor."[3] This is a considerable endorsement when at the same time CNAL units report that "the information gathering capacity of the system immediately eliminates relatively few of present day [paper work] requirements."[4]

[1]Lot Ensey, Rear Admiral, U. S. Navy, Commander Cruiser-Destroyer Flotilla Nine, official letter, serial 99, March 9, 1964, 3.

[2]Charles L. Wall, Commander, U. S. Navy, Staff, Commander Cruiser-Destroyer Flotilla Nine, official letter, February 24, 1964.

[3]Paul H. Ramsey, Vice Admiral, U. S. Navy, Commander Naval Air Force, U. S. Atlantic Fleet, official letter, serial 4130, July 2, 1964, 1.

[4]Ibid., 3.

However, there presumably remain some doubters. Conceivably there are officers and men in the Navy today who have had the opportunity and experience to serve only in organizations which exhibited all the magnificence of being run by an all knowing born leader. Unfortunately, most of us frequently encountered the fallible type manager who occasionally lacked information or took questionable action. Therefore we see the need for a system that supplies a service-wide facility for measurement, a systematic method of solving problems, and a format for quantifying operational needs which is more sensitive to the operator's view. However, are we willing to accept the all encompassing "3 M System?" If we do, will the personnel in doubt as to the need accept it?

Integrated Data Processing

One of the first questions the reader might ask is why the Navy would saddle its operating forces with a mass maintenance management tool such as integrated data processing (IDP). Haven't the operating forces consistently achieved victory with the continually evolving conventional maintenance systems? Aren't modern sophisticated aircraft, ships, and missiles still effectively maintained by these systems? True, it would be difficult to deny the value of IDP to the shore establishment which is similar in so many ways to many of the nations extremely successful IDP oriented commercial enterprises. However, the operating forces have always functioned under a different discipline. They are managed by military professionals who have been well schooled throughout their careers in the art (or science) of achieving victory in combat while ensuring economy of forces, rather than in minimizing costs

to maximize profit in a competitive society.

The answer as to why IDP should be installed may not be obvious. However, the universal understanding that management, either in the context of naval operating forces at sea or commercial enterprises ashore, requires information in order to manage is obvious. This information must be received accurately, in a timely manner, and without excessive effort. The requirement for reports containing information are the key to "selling" data processing. IDP is a refinement in the field of automatic data processing (ADP). Rather than collecting piece meal bits of information, some of value and others not, IDP calls for systematic organization, coordination, and an uninterrupted flow of <u>essential</u> data needed by management to exercise the functions of planning, organizing, direction, and control.

Maintenance management must always be interested in improving quality, promoting effectiveness and achieving maximum efficiency. Without this desire, it would be impossible to compete in this era of rapid, continuing technological change. In the past, reports that placed emphasis on the historical situation were satisfactory for day to day or even combat operations. However, today we must have a reporting system that is compatible with the need for timely information on historical, current, and future events. Further, the reports must be so formulated, and the system so arranged, that trends will become immediately evident.

Reports, however, are only the means. The end results very definitely hinge on both the capability of management and the

significance of the reports. Efficiency and effectiveness of the system reflects the timeliness, accuracy, and conciseness of the information contained within the report. Here again an integrated system of data collection, designed so as to reduce the chaff--unneeded and unwarranted volume--and emphasize the significant facts, is the answer.

The Exception Principle

SNMMS is proclaimed to be a system that provides the manager with the significant facts. Evidences of adherence to the exception principle are encountered in various areas, i.e., man-hour accounting, and the work schedules which are a part of the control board. If the exception principle is adopted to any degree, the manager, now deluged with publications, requirements, reports, and vast amounts of other unnecessary details would be free to truly manage. He would find it necessary to peruse only specific, condensed reports designed to focus the system and his attention on significant variations from the predetermined standards.

However, before management by exception can be effectively implemented, a set of decision rules must be formulated. These decision rules would include the following:

What is a routine matter?

What is a significant fact?

When is a variation significant?

What is the relationship to predetermined standards?

These are typical questions that must be answered. It can be seen that areas which in the past have been only subjectively treated

now must necessarily be quantified. By reducing these areas to specifics, then to mathematical expressions where possible, many problems of the manager can be eliminated. Whereas in the past it might be reasonably ascertained that certain practices could lead only to reduced readiness, it can now be proven. This system of management is now the approved and highly desired goal for the Department of Defense.

Difficulties of the Past

It was noted in Chapter I that a standardized Navy-wide aircraft maintenance organization was directed in 1959. This organization, although it exists today, was not highly successful or widely accepted in its early years.

An important factor in this lack of acceptance was that little planning accompanied implementation. Any effort made to provide information and training to the personnel involved in operating force maintenance was not apparent. Many commands reorganized only because they had to. Few managers realized that their organizations were expensive, rather inefficient remnants of bygone days. No "selling" program was conducted. Benefits that could be achieved through reorganization were not made evident. The existence of "inertia" involving the resistance to change was overlooked. Somewhere along the chain of command some very important management principles were not considered. This management error caused a state of confusion which is only now being fully eliminated. But, was the lesson learned? This aspect is discussed later in this paper.

Personnel Requirements

There has long been a need within the Navy for a reliable method of forecasting accurate personnel requirements. In recent years we have depended on the system manufacturing contractor to furnish information concerning personnel based on equipment utilization, time between inspections, etc. Although this method has worked fairly well, it did not solve the problem concerning older equipment. This proved quite serious since the older equipment generally required a greater proportion of maintenance and hence a greater share of the personnel.

The need for an accurate way of determining personnel requirements became clearly evident when the Navy began to encounter the Department of Defense demands for proof of efficiency. The point that military decisions are basically economic decisions was forcefully made clear. Where in the past allocations frequently resulted from the mere statement of necessity, now emerged a situation where alternative allocations and methods were closely considered.

An important area of the 1959 aircraft maintenance organization which would have provided personnel requirement information was generally rejected. This was a man-hour accounting system. Few commands understood the reasons for such a system or considered it of great enough importance to bother with. Resistance was encountered with the mere mention of recording the employment and whereabouts of personnel. The result was that man-hour accounting became an optional function. At the present time BUWEPS Instruction

4700.2 describes a man-hour accounting system, intimates that a similar system is mandatory, but then backs off to a permissive approach by stating "that the analysis of some effective man-hour accounting system is the most valid means to justify changes in personnel allowance to CNO."[5]

Exception Time Accounting in SNMMS

Exception time accounting (ETA) is an integral part of the data collection portion of SNMMS. ETA is designed to provide management with man-hour information which might indicate trends as well as set forth specific current information. Closely adhered to, ETA is expected to provide an accurate standardized procedure for detecting deviations from planned programs at a minimum cost.

The ideal work situation, where a man works the entire day at his assigned job, is the basis of the system. Any time a man is absent from his job during normal working hours an exception exists and a report is made. The exceptions are totaled by Maintenance Group at the end of a designated period, and compared to a listing of the manhours available during the same period. Management then has the information at hand which with competent analysis should indicate areas of concern. Excessive utilization of personnel for other than their primary assignments will be evident as will special liberty, personal errands, lag, and travel time.

[5]Chief Of The Bureau Of Naval Weapons, The Naval Aircraft Maintenance Program. BUWEPSINST 4700.2. (Washington: 21 June 1962), p. 11-3.

ETA is currently scheduled for introduction into all industrial type activities. Included in this category are aircraft squadrons and ships with repair departments.

The "3 M System" Approach

The "3 M System," unlike the 1959 aviation maintenance organization, is utilizing a program of indoctrination and training during the installation stage. Fleet Training Centers are providing formal training to operating force personnel while the Fleet Work Study Groups, in addition to training instructors for the Training Centers, are providing MDCS implementation teams which tour the fleet. For the long term, Bureau of Naval Personnel schools will modify their curricula so as to properly indoctrinate all enlisted and officer personnel reporting to the operating forces after initial system installation.

Weaknesses of SNMMS.

The literature and information now available on SNMMS indicates very few areas of weakness. Quite possibly this is a true portrayal of the system. On the other hand, the general shortage of literature and information from Navy sources, other than high levels of management and the SNMMS implementation managers, the Fleet Work Study Groups, might in itself conceal the existence of extensive problem areas. Areas of weakness, apparent at this time are:

(1) The almost total absence of in-house Navy personnel familiar with the modern tools of management.

(2) The lack of a top level, flag rank billet, directly in

the chain of command, with the responsibility for developing, directing and controlling the implementation of SNMMS.

(3) The failure to readily acknowledge that the Naval Aircraft Maintenance Program, first implemented in 1959, and still in existence, has not been a complete success.

(4) The inability to maintain the ambitious time-phased plan of installation as promulgated.

(5) The exemption of maintenance organization structure from the total systems analysis.

(6) The methods of data collection/transmission are time consuming and highly susceptible to operator induced errors.

In-house Personnel-At the present time the Navy does not have the in-house capability of developing, installing, or operating the data processing system that is a very necessary part of SNMMS. This function is now provided by the combined effort of a Navy-industry team in which the industry members must be readily available and thoroughly familiar with Navy methods and requirements. Fortunately this shortcoming is recognized.[6] However, as yet nothing that will provide a long range solution to the problem has been initiated. This is not to say that the training of Navy personnel for SNMMS is not underway, because it is. However, the training presently being conducted, and that planned for the future, is only sufficient to provide the minimum amount of necessary knowledge to the operators. There is no indication that a program intended to educate personnel in the design

[6]Chief of Naval Operations, Standard Navy Maintenance Management System. OPNAVINST 4700.16A. (Washington: 1 August, 1963), Enclosure 1, p. 8.

and capabilities of a data processing system is contemplated.

The Officer-in-Charge, Fleet Work Study Group, Pacific, has expressed a need for an officer with a management/computer education. This need is supported by statements set forth in OPNAVINST 4700.16A.

A survey of the mission of the Study Group indicated that a graduate of the Management Data Processing curriculum would be of great benefit. The chance that a graduate will be ordered there appears slight when the existing billets call for line officers; this year's Data Processing class consists of all Supply Corps officers with the exception of two aviators, two Marine officers, and one Wave.

Flag Rank Billet-A maintenance position at or near the Assistant Chief of Naval Operations level, in the chain of command, would give SNMMS an additional look of permanence and authority. The development and implementation of modernized and improved programs would quite probably reflect a more continuous pattern in the future. The likelihood of another archaic maintenance system developing would be remote. As a secondary benefit, the career opportunities for maintenance specialists, now limited, would be greatly enhanced.

Naval Aircraft Maintenance Program-SNMMS could quite possibly be adversely affected by the failure to admit that the subject program was not completely successful. Existing maintenance shortcomings are being set forth in an effort to convince personnel that SNMMS is needed. However, these shortcomings are being mentioned

in general rather than attributing them to a specific type unit. No information has been found that is critical of the installation methods utilized with the Aircraft Maintenance System or with the system itself. Personnel who observed and endured unpleasant experiences with the aircraft program might tend to resist SNMMS due to a belief of near complete similarity and evolution. A forthright statement, pointing out how SNMMS is soundly based on specific proven management concepts, and how efforts have been made to avoid the pitfalls encountered by the prior program, would be an aid in gaining acceptance.

Phase-in Delay-The "3 M System" is presently behind implementation schedule. The phase-in plan originally decided upon was very ambitious and was made early in SNMMS's life. It called for the system to be in full operation in something on the order of four years. The present lag could be caused by a number of things including superficial planning, incomplete knowledge of what was entailed, and inexperienced personnel. Superficial planning can be disregarded, since there is ample evidence of extremely well planned actions already executed and scheduled for the future. Incomplete knowledge, since SNMMS is a new concept, certainly is a factor. However, it appears that the lack of in-house personnel with the proper background and experience has been the main difficulty.

Organizational Structure

In 1964, the number of "levels" of Navy aviation maintenance was reduced from six to three with various changes taking place at

all levels. Of greatest importance was the shift of Air Station Aircraft Maintenance Department emphasis from station aircraft to the direct support of Fleet aircraft. This change reflects to a certain degree the present Air Force organization headed by a Chief of Maintenance. However, the Navy organization mentioned is at the "intermediate" level. Individual squadrons still conduct all "organizational" level maintenance independently. As such, duplication of effort continues to exist.

Maintenance in ships is conducive to a greater degree of duplication than in aviation. Where in aviation, one department performs the vast majority of maintenance evolutions, in ships each department performs its own. Only during periods of maintenance availability, when a yard or tender force performs the work, is coordination likely to exist. TSC applied to this situation would at least provide a number of avenues for further study. Additional analysis may not produce desirable alternatives, but documented facts would be presented to justify the existing organizations. For example, a system similar to that being utilized by the Air Force can work in carrier aviation. There is no apparent reason why a billet equivalent to the Air Force Chief of Maintenance cannot be established at Navy air wing or higher level. Such a change would eliminate duplication and, hopefully, reduce personnel requirements. An adaptation of the organization would also work in a ship. A "maintenance" department could be established to undertake those functions now performed by diverse operators.

Data Collection/Transmission-The fact that data transmission

equipment is presently not programmed for the fleet is a serious handicap for a quick-time system. However, of greater concern is the vast opportunity for personnel induced error in the collection phase.

An Air Force story making the rounds concerns an activity that has for months used the action taken code describing "painting" on all maintenance action reports. These reports have included fuel control failures, radio failures, and the like. With approximately four and one-half million pieces of paper generated each month by AFM 66-1,[7] the reason for this coding has yet to be determined.

The moral of this story is that honest errors, "gun decking," or an outright attempt at being a comic will foul the system. Presently, only education and controls will prevent the latter two difficulties. Honest errors may also be reduced by these methods, but the best way to achieve their elimination is through procedures that reduce exposure. The ultimate answer will be an automatic input to the system from the equipment itself, independent of the maintenance man. This method is a possibility of the future, but for the present we must reduce to a minimum handling and transcribing of data.

The present system, utilizing forms completed by the maintenance man and cards punched at the Processing Center is totally unsatisfactory. Once key punch equipment reaches the ships the situation will improve, but the intermediate man will still be utilized.

[7]J. C. Kiriluk, Maintenance Editor, Approach, personal letter, October 8, 1964.

However, the shipboard maintenance control function, properly supervised, can provide an adequate verification check when teamed with a reasonably educated conscientious maintenance man. The problem therefore is to find the requisite maintenance man. If the FUR system is any indication of what to expect, a tremendous problem, yet unrecognized, exists.

Lessons Learned

Little if any evidence exists which would indicate that the Navy has profited from past shortcomings since the aircraft maintenance reorganization of 1959 and prior to the advent of the "3 M System." One negative example is the Naval Air Training and Operating Procedures Standardization program, known as NATOPS, which was rushed into existence in 1961.

Operational activities were disrupted and demoralized by the creation of a NATOPS staff position which by its description was to facilitate an informer function. NATOPS manuals, incomplete, inaccurate, and at best copies of existing materials, were rapidly promulgated under the cloak of filling the gap between the NWP's and specific aircraft flight manuals. Planning was nil, personnel were not informed promptly and adequately as to what could be expected. Limited facts and exaggerated knowledge of the Air Force pilot standardization program, which was purported to eliminate all pilot prerogatives, caused a further down-turn in morale. Controls, in the form of ground and flight training checks, were so devised as to be voluminous and complicated. The resulting flight training adjective grading system was psychologically adverse.

Ultimately, NATOPS didn't turn out to be the ogre first described. In fact at times the program gives indications of wilting away. In either event, however, the methods, procedures, and techniques, involved in all aspects of NATOPS, were not proper. The program was implemented as though it were the first extensive change ever made in any organization. Known and widely accepted management techniques were overlooked or disregarded. In essence, what could have been a very useful program is still operating under the handicap created at the time of its conception.

Summary

The "3 M System" is being proclaimed as the answer to Navy maintenance difficulties and well it may be. In areas where the system is operating, managers speak of it in glowing terms. Problems do exist, but where recognized they are presently well in hand. Methods and techniques of leadership and management, not previously evident in maintenance organizations, are well defined. A "sales" and training program is an integral part of the system.

CHAPTER V

SUMMARY AND CONCLUSIONS

The Standard Navy Maintenance Management System, in its entirety, is a long needed step toward the goal of improved fleet and material readiness. It was designed by a Navy-industry team of experts and takes full advantage of the majority of recognized management and data processing techniques and principles.

The "3 M System," unlike so many Navy programs, is based on a careful analysis of the requirements and tasks to be accomplished. Changes were not made for the sake of change or in a piecemeal fashion. The individual man, and each level of management, was thoroughly considered before any changes were executed. An information system, comparable with the best, was established to promulgate the "word" concerning SNMMS. Published information, both official and unofficial, although highly optimistic, is carefully designed to set forth the facts. No deliberate attempt to conceal the systems ultimate objective is encountered. Attempts of this nature have been prevalent in the past.

The bibliographical material researched concurs with the majority of procedures used within SNMMS. The directives concerning the "3 M System," supplemented by the various magazine articles, set forth many contemporary management ideas and techniques. Extensive benefits, to the Navy as a whole, should be derived from "spin off" SNMMS's information.

The "3 M System" holds very close to the total systems concept in all areas with the exception of organizational analysis and data transmission.

In the organizational area, there is no evidence supporting any structural consideration. This may be a fundamental flaw capable of contributing to SNMMS failure. Since the system is still in the installation phase it is possible to proceed with an organizational structure analysis at this time. Should the present structure be found sound and compatible with SNMMS, system implementation will have been delayed, but not without worthwhile results. Foremost of these would be the emphasis on existing good management exemplified by a willingness to investigate doubtful areas. If the structure is found lacking, necessary changes can be made prior to final SNMMS installation. This finding would be a blow to the prestige of the "3 M System," but it need not be fatal. Determination of incompatibility at some later date may destroy SNMMS and substantially hinder other programs both in and out of maintenance.

Industrial type activities, which are functionally organized to achieve a maintenance objective, possess a structure that can be modified with relative ease and occasionally is. However, in combatant ships, the traditional organization has changed very little since the advent of steam. In either case, the apparent failure to conduct a thorough analysis conflicts with the overall effectiveness of the development and implementation of SNMMS.

Without an adequate method of transmitting data, the entire Maintenance Data Collection System is rendered ineffective. This situation, serious as it is, may be better than one in which carelessly collected, inaccurate data is speedily transmitted. The latter case then is of prime importance since the former tends to be obvious.

The methods now under evaluation in MDCS do not have controls which will ensure accuracy. In fact SNMMS, as it exists, calls for the execution of maintenance action and related reports at the lowest possible level. If we consider the results of a similar plan in the FUR system, it should become immediately obvious that the current version of MDCS won't work. The man who does the work is just not interested in filling out required reports. At times this lack of interest is accompanied by basic inability to understand and perform the "paper work" function. Furthermore, the maintenance man's disinterest and inability sometimes exists at various supervisory levels up the chain of command.

Obviously then, other data collection methods must be developed. Since automatic inputs are unlikely in the near future, they are not the answer. In fact, no simple answer exists. The best approach the Navy can make at this time is to contract for a detailed study of what other organizations, both military and civilian, are doing under similar conditions.

A solution to the collection problem must be accompanied by an adequate transmission system. It will be difficult to

justify any expenditures in the areas of collection or processing in light of the transmission methods contemplated. The best of data, unless timely, is useless.

Computers have been designed and programmed to assist humans in numerous ways. They are useful in scientific, scheduling, inventory, accounting, and game playing applications, to name but a few. Nevertheless, the fact remains that the quality of output will at best reflect the quality of input. The quality of input, although not totally dependent on timeliness, is influenced greatly by it.

Another area that may cause difficulty is the tremendous number of reports that SNMMS will generate. As noted, AFM 66-1 generates four and one-half million pieces of paper each month. Prorated, this will be a significant number of reports emanating from each activity. Unfortunately, in most cases, existing reports will not be eliminated in the immediate future.

Conceivably, the entire SNMMS could be discarded as a result of unsatisfactory data transmission/processing. This recently happened in one business concern. Specifically, the level of ignorance within the business was such that an advertising campaign was based on the scrapping of data processing equipment. Apparently the executives concerned failed to recognize that the "garbage out" only reflected the "garbage in," which in turn reflected managements knowledge and ability.[1]

[1]News item in the San Francisco Sunday Chronicle, February 7, 1965.

Of paramount interest is how the Navy achieved a commendable level of total systems analysis so close on the heels of the inept step into NATOPS. Because of the NATOPS introduction and of other recent programs, efforts should be made to accentuate the differences in concept between them and SNMMS so that the degree of adverse inertia encountered will be decreased.

In conclusion, it is quite apparent that the "3 M System" is a highly desirable, well developed and implemented, long needed step forward in Navy maintenance circles. The system design compares favorably to the theories of a broad spectrum of management experts.

SNMMS has been exceptionally well controlled by the Maintenance and Material Management Project Center. The installation of the system into the fleet, by the Fleet Work Study Groups, has reflected an admirable degree of forethought, planning and resourcefulness. The FWSG training programs, supplemented by articles which have appeared in Approach, All Hands, and the U. S. Naval Institute Proceedings, have gone a long way in suppressing inevitable change-opposing inertia.

Suggestions For Further Research

Being a new system currently under development, all aspects of SNMMS are available for further research and analysis. However, of greatest concern and worthy of immediate study are the fundamental weaknesses noted in the areas of data collection/transmission and management hierarchy. It is truly inconceivable that a comprehensive plan such as the "3 M System" can consider the prescribed input method, the mails and messenger service, compatible with the

advanced techniques being utilized throughout the remainder of the system. Furthermore, even though the maintenance organizational structure may ultimately be proven sound, it must be analyzed.

The bibliography assembled here will probably be outdated rapidly as a result of changes brought on through system evaluation and modifications. However, the concepts and techniques prescribed by management authorities will continue to provide a sound basis for further research.

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APPENDIX I

THE STODDARD STORY

24 February 1964

From: Commander Charles L. WALL, U.S. Navy, 224184/1100
To: Commander Cruiser-Destroyer Flotilla NINE
Care of Fleet Post Office, San Francisco, California

Subj: Material Readiness

1. During recent conversations we have discussed the enviable record of material readiness achieved by USS STODDARD (DD-566), a 20 year old 2100 ton destroyer, as evidenced by only one significant equipment outage during the four months (to date) of its current assignment with SEVENTH Fleet. As suggested by you I have reduced to writing a summary of the material status of that vessel and actions taken during the period of my command, June 1962 to February 1964, to achieve and maintain the current state of readiness. In addition I have attempted to draw some conclusions and offer recommendations which may be of value to others.

2. At the conclusion of a SEVENTH fleet tour in June 1962 electronics and ordnance readiness had deteriorated badly. The engineering plant was fully operational but feed water consumption was excessive.

3. During the period July - December 1962 the ship was able to maintain its operating schedule in EASTPAC and on short notice performed escort duties in connection with the Cuban Quarantine during October and November. Throughout this period the best efforts of ship's force were sufficient only to maintain the status quo; there was little, if any, improvement in material readiness and the performance of various equipments. Although unable to achieve any significant improvement in readiness and performance, ship's force personnel were able to identify and to document the nature and probable extent of deficiencies and to plan a comprehensive program for the utilization of ship's force, tender, and shipyard efforts during the Interim Availability scheduled for the first quarter of FY 1963.

4. Although the final funding of the shipyard phase of the Interim Availability approximated that afforded other ships of the type, the initial funding did not provide for all required work. The necessity for the repair of additional items, however, was supported by operating records and inspections and the required funds were granted. At the conclusion of the shipyard period (30 March 1963) all known items of a major nature except the retubing of boiler superheaters had been accomplished. (See paragraph 6 in connection with superheaters.)

5. During the period May-June 1963 the Planned Maintenance System (PMS) was installed in the Engineering Department and at about the same time efforts were directed toward preparation for overseas movement (POM) in October 1963 for a normal tour with SEVENTH Fleet. Representative units of major equipments such as forced draft blowers, condensate pumps, feed booster pumps, and fuel oil pumps that were apparently operating normally were selected for early PMS inspection. In many instances these inspections revealed unsuspected deterioration and the need for early repair. When required the units that had been opened were overhauled at that time and the records of other units of the same type were reviewed. It was concluded that those with a similar operational and repair history would be in approximately the same condition and, hence, would also require overhaul. Not all of the parts required for these overhauls were contained in COSAL and those in COSAL were not on board in sufficient quantity to perform the number of overhauls contemplated. It was soon apparent that the normal OPTAR could not be managed so as to provide these repair parts and the other items essential to a successful POM. An augmentation of OPTAR was obtained from the Type Commander on the basis of equipment condition as supported by the PMS findings and a logical schedule of overhaul by ship's force. The majority of this work was concluded prior to overseas movement. However, it was necessary to defer a portion for accomplishment during scheduled upkeep time while in the SEVENTH Fleet.

6. The superheater tubes in two boilers were in marginal condition at the time of the Interim Availability. However, the fact that they would withstand the prescribed hydrostatic pressure and were otherwise operational precluded the expenditure of substantial funds for their retubing at that time. In August 1963 during boiler maintenance in connection with the POM a number of tubes in one of the superheaters failed to meet hydrostatic pressure requirements. This evidence of condition and the imminent departure of the ship for duty with SEVENTH Fleet proved to be sufficient justification for the renewal of all the superheater tubes in both boilers.

7. Upon joining SEVENTH Fleet approximately 98% of the repair parts in the COSAL were on board and the remaining 2% were on order. In addition the parts for scheduled, but as yet uncompleted, overhauls of PMS origin and other selected non-COSAL items of an insurance nature were on board. Routine maintenance and planned equipment overhaul has continued as practicable for at sea and in port and during scheduled upkeep periods. Except for the one fuel oil booster pump casualty which required complete replacement of the unit, equipment outages have been corrected as occuring. Although some needed repair parts have been obtained from ships in company, corrective action has normally been possible from resources within the ship.

8. Conclusions.

a. A high degree of material readiness can be achieved by an orderly, well planned program of ship's force work, adequately supported by repair parts and materials, and assisted by outside (tender and shipyard) resources to the extent justified.

b. Management of maintenance and repair resources depends upon the full knowledge of material conditions which is obtainable through a comprehensive schedule of tests and inspections (PMS) in conjunction with regular operating records.

c. In order to achieve maximum material readiness for assignment to SEVENTH Fleet as for any other high priority period or task the schedule of tests and inspections (PMS) must be keyed to that assignment.

d. A fully funded COSAL will normally provide sufficient in-house resources with which to maintain a high state of readiness once that condition has been achieved.

9. Recommendation. It is recommended that the PMS be oriented to POM in such a manner that the requirement for non-COSAL repair parts and for COSAL items in excess of allowance can be anticipated and planned for. It should be axiomatic that all known defects are corrected during the POM period.

/s/ C. L. Wall
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